Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, 25.01.2011

(16:00 in Room 459/30b)

Femtosecond Stabilisation of the Long Range Optical Beam Transport for the Seeding Experiment at FLASH

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Abstract

Free Electron Lasers are usually operated in the self–amplified spontaneous emission mode (SASE). However, the statistical nature of SASE leads to pulse-to-pulse intensity and spectral fluctuations. Furthermore, arrival time fluctuations of the electron bunch at the undulator entrance lead to a temporal jitter of the XUV pulses, effectively limititing the resolution of laser/XUV pump-probe experiments. In order to overcome these limitations, a seeding experiment for wavelengths below 40 nm has been installed at the Free electron LASer in Hamburg (FLASH). The experiment consists of three stations: A high harmonic generation (HHG) laboratory, which contains the optical 800 nm driving laser and the HHG source. Secondly, the undulator section, where the actual seeding of the electron bunch takes place and thirdly, the experimental hutch for XUV pulse characterization. A fraction of the optical driving laser is guided over a distance of 60 meters from the HHG laboratory into the experimental hutch for future characterization of the seeded XUV pulse. To ensure a good temporal resolution between the seeded XUV pulse and the optical pulse the arrival time of the optical laser pulse has to be stabilized. In this contribution the temporal stabilisation technique for the laser system and optical transport beamline, including a pulse compressor and crosscorrelator will be presented in detail. Also, the influence of a stabilisation of the temperature on the drift of the laser system is demonstrated.

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